Sampling Distributions Checkpoint 2

Question (1:prob4-1)

Which of the following statements about the sampling distribution of the sample mean, x-bar, is not true?

A: The distribution is normal regardless of the shape of the population distribution, as long as the sample size, *n*, is large enough.

B: The distribution is normal regardless of the sample size, as long as the population distribution is normal.

C: The distribution's mean is the same as the population mean.

D: The distribution's standard deviation is smaller than the population standard deviation.

E: All of the above statements are correct.

Feedback

A : 0

X Not quite right. All of these statements are true. The correct answer is E.

B : 0

X Not quite right. All of these statements are true. The correct answer is E.

C : 0

X Not quite right. All of these statements are true. The correct answer is E.

D : 0

X Not quite right. All of these statements are true. The correct answer is E.

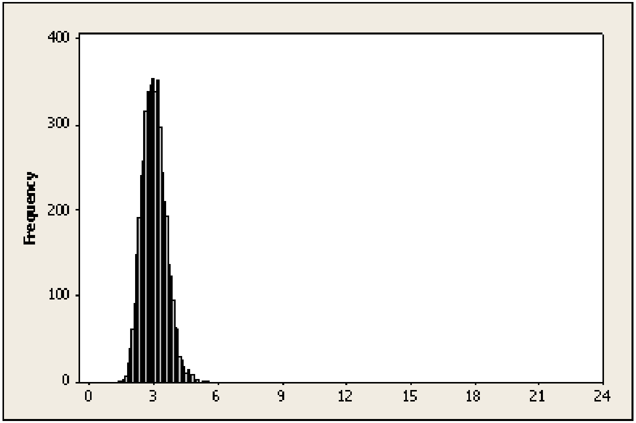
E : 10

Good job! All the statements are correct. (A) the sampling distribution of x-bar becomes closer and closer to normal as the sample size, n, increases. This happens regardless of the distribution of the variable in the population. The only thing that will be affected by the population distribution is how large the sample size n should be to get normality. (B) if the population distribution happens to be normal to start with, then the sampling distribution of x-bar is always normal, regardless of the sample size. (C) the sampling distribution of x-bar has mean μ, the same as the population mean. (D) the sampling distribution of x-bar has standard deviation σ n , which is smaller than the population standard deviation. which is σ.

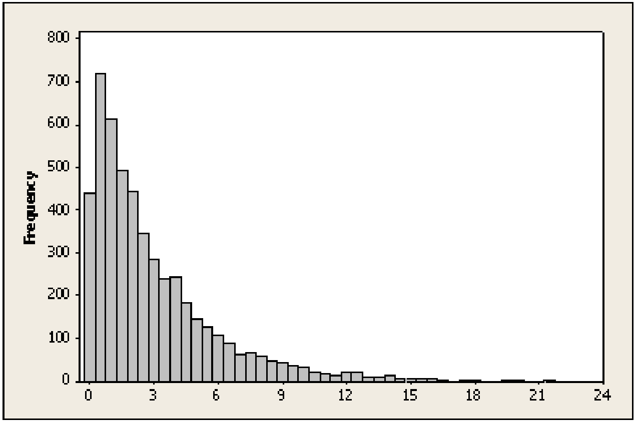
The next two questions refer to the following information:

Pictured below (in scrambled order) are three histograms: One of them represents a population distribution. The other two are sampling distributions of x-bar; one for sample size n = 5, and one for sample size n = 30.

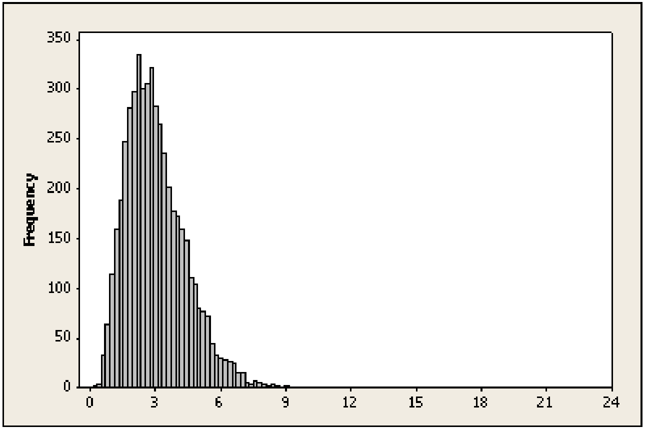
Histogram 1:



Histogram 2:



Histogram 3:



Question (2:prob4-3)

Which of the following 6 possible orderings of the three histograms represents the sequence:

- Population distribution
- Sampling distribution of x-bar for sample size n = 5
- Sampling distribution of x-bar for sample size n = 30?

A: histogram 1, histogram 2, histogram 3
B: histogram 1, histogram 3, histogram 2
C: histogram 2, histogram 1, histogram 3
D: histogram 2, histogram 3, histogram 1
E: histogram 3, histogram 1, histogram 2
F: histogram 3, histogram 2, histogram 1

Feedback

A : 0

✗ This is not quite right. The Central Limit Theorem tells us that as the sample size increases, the sampling distribution of x-bar tends to a normal distribution. The distribution that looks the least normal should be the population distribution. Consider the remaining options. (D) is the right answer.

B : 0

✗ This is not quite right. The Central Limit Theorem tells us that as the sample size increases, the sampling distribution of x-bar tends to a normal distribution. The distribution that looks the least normal should be the population distribution. Consider the remaining options. (D) is the right answer.

C : 0

✗ This is not quite right. The Central Limit Theorem tells us that as the sample size increases, the sampling distribution of x-bar tends to a normal distribution. Also, we know that as the sample size increases, the standard deviation of the sampling distribution of x-bar decreases. How does the standard deviation of histogram 1 compare to that of histogram 3? Consider the remaining options. (D) is the right answer.

D : 10

✓ Good job! Since as the sample size increases the sampling distribution of x-bar approaches normality, the order in which the histograms look more and more normal is 2, 3, 1.

E : 0

✗ This is not quite right. The Central Limit Theorem tells us that as the sample size increases, the sampling distribution of x-bar tends to a normal distribution. Also, we know that as the sample size increases, the standard deviation of the sampling distribution of x-bar decreases. Considering these facts, does it make sense for the population distribution to have less spread than the sampling distribution for x-bar with n = 30? Consider the remaining options. (D) is the right answer.

F : 0

✗ This is not quite right. The Central Limit Theorem tells us that, regardless of the population distribution, the sampling distribution of x-bar tends to a normal distribution as the sample size increases. It does not make sense to order the histograms as 3, 2, 1 because the sampling distribution of x-bar with n = 5 would be less normally distributed than the population. Consider the remaining options. (D) is the right answer.

Question (3:prob4-4)

Based on the histograms, the most likely value of the population mean is:

A: 0.5

B: 3.0

C: 4.5

D: 7.5

E: 350

Feedback

A : 0

X This is not quite right. Although the mode on histogram 2 is located close to 0.5, this does not indicate that the most likely value of the population mean is 0.5. The Central Limit Theorem (CLT) tells us that as the sample size n increases, the sampling distribution of x-bar tends to a normal distribution with a mean equal to the population mean. Keeping in mind the CLT, you should be using one of the sampling distributions to find the most likely value of the population mean. Consider the remaining options. (B) is the right answer.

B : 10

Good job! We know that the sampling distribution of x-bar has mean Î¼, the same as the population mean. Since we see from histogram 3 that the sampling distribution of x-bar has a mean of approximately 3, this must also be the mean in the population.

C : 0

This is not quite right. The Central Limit Theorem (CLT) tells us that as the sample size n increases, the sampling distribution of x-bar tends to a normal distribution with a mean equal to the population mean. Keeping in mind the CLT, you should be using one of the sampling distributions to find the most likely value of the population mean. Consider the remaining options. (B) is the right answer.

D : 0

This is not quite right. The Central Limit Theorem tells us

X that as the sample size n increases, the sampling distribution of x-bar tends to a normal distribution, with a mean equal to the population mean. Keeping in mind the CLT, you should be using one of the sampling distributions to find the most likely value of the population mean. Consider the remaining options. (B) is the right answer.

E : 0

X This is not quite right. Although the highest frequency on histogram 1 is approximately 350, this does not indicate that the most likely value of the population mean is 350. The Central Limit Theorem (CLT) tells us that as the sample size n increases, the sampling distribution of x-bar tends to a normal distribution, with a mean equal to the population mean. Keeping in mind the CLT, you should be using one of the sampling distributions to find the most likely value of the population mean. Consider the remaining options. (B) is the right answer.

Question (4:prob4-10)

Suppose that a candy company makes a candy bar whose weight is supposed to be 50 grams, but in fact, the weight varies from bar to bar according to a normal distribution with mean μ = 50 grams and standard deviation σ = 2 grams.

If the company sells the candy bars in packs of 4 bars, what can we say about the likelihood that the *average* weight of the bars in a randomly selected pack is 4 or more grams ***lighter*** than advertised?

A: There is no way to evaluate this likelihood, since the sample size (n = 4) is too small.

B: There is about a 16% chance of this occurring.

C: There is about a 5% chance of this occurring.

D: There is about a 2.5% chance of this occurring.

E: It is extremely unlikely for this to occur; the probability is very close to 0.

Feedback

A : 0

This is not quite right. The sampling distribution of x-bar is normally distributed regardless of sample size and the sampling distribution will have a mean Î¼ and standard deviation dependent on the sample size. Consider the remaining options. (E) is the right answer.

B : 0

This is not quite right. The question is asking for $P(\bar{X} \leq 46)$. You should be using the sampling distribution of x-bar to find the requested probability. Consider the remaining options. (E) is the right answer.

C : 0

This is not quite right. The question is asking for $P(\bar{X} \leq 46)$. You should be using the sampling distribution of x-bar to find the requested probability. Consider the remaining options. (E) is the right answer.

D : 0

✗ This is not quite right. The question is asking for $P(\bar{X} \leq 46)$. You should be using the sampling distribution of x-bar to find the requested probability. Consider the remaining options. (E) is the right answer.

E : 10

✓ Good job! Here we need to find the likelihood that the average weight of 4 bars is 4 grams or more below the advertised weight of 50 grams. In other words ,we need to find the likelihood that x-bar is 46 grams or less: $P(\bar{X} \leq 46)$. The sampling distribution of x-bar is normal with the mean = 50 grams and the standard deviation = 1 gram. The Z-score of 46 is then -4, and therefore $P(\bar{X} \leq 46) = P(Z < -4) \approx 0$.